dure is a direct graft done at the time of resection. A saphenous vein graft replaces the resected artery usually from the high cervical segment to the petrous or cavernous portion. This operation has hazards and complications, such as strokes, meningitis, cranial nerve deficits, and death. It is essential to cover the graft with fresh vascularized tissue, preferably a free flap, and to isolate it from the upper aerodigestive tract.

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Olfactory Impairment

IMPAIRED OLFACTION (loss of sense of smell) is a common problem that deserves greater attention from clinicians and researchers. The most current estimate is that 2 million Americans suffer from an impaired sense of smell, but the actual number exceeds that estimate. An impaired sense of smell not only adversely affects culinary pleasures but also is a health hazard, for patients with an impaired sense of smell cannot smell smoke, gas leaks, or spoiled and rotten food. Odors are also an important part of our sensory environment, and patients with impaired olfaction lack the enjoyment of the environment and their loved ones and are handicapped in such simple matters as body hygiene. Although current research focuses on the gene coding for specific smell recognition and the ways in which we sense and process olfactory information, there is an ever-increasing awareness and understanding of the causes of impaired sense of smell. In an effort to assist primary care professionals in diagnosing and managing this disorder, the following information regarding its causes is offered.

Inflammatory rhinitis, be it allergic, infectious, irritative, or mixed, will impair the sense of smell when the inflammatory process involves the olfactory cleft, the roof of the nasal cavity wherein the olfactory epithelium resides. This is best diagnosed with coronal computed tomographic scans. Conductive defects, those conditions in which air and odorants do not reach the olfactory epithelium, seem to occur only when the nose is totally occluded or the olfactory cleft totally obstructed. Septal deflection is not a cause of an impaired sense of smell. Bilateral choanal atresia and large nasal tumors, such as severe nasal polyposis or a large meningomyelocele, are occasionally causes.

Olfactory impairment is common during upper respiratory tract viral infections. In some viral infections occurring during the middle and late years of life, the olfactory epithelium appears to be destroyed, causing an irreversible hyposmia. In such cases, inflammatory disorders, such as ethmoiditis, must be excluded.

Head trauma, typically from a frontal or occipital blow, can stretch or shear the olfactory nerves. If stretched, the sense of smell often returns. If sheared, olfaction rarely, if ever, recovers. Neurosurgical approaches to the floor of the anterior cranial fossa often necessitate cutting the olfactory fila; the resulting olfactory impairment is complete and permanent.

Exposures to various toxic chemicals and pollutants can cause olfactory impairment. Exposures severe enough to cause mucosal injury and burning can impair the sense of smell with a single exposure. Long-term exposure to certain known toxic chemicals, such as formaldehyde, ammonia, acetone, and many other noxious chemicals, may also destroy olfaction.

Congenital causes are recognized. Some are due to genetic deficiencies; others to probable neonatal or early childhood trauma. Certain genetic metabolic diseases are associated with an impaired sense of smell, Kallmann's syndrome (hypogonadotropic eunuchoidism) being the best known.

A recently recognized cause includes neurologic degenerative disease. Impaired olfaction has now been clearly documented to occur with Alzheimer's disease, Parkinson's disease, and Huntington's chorea. Aging itself is a well-known cause of olfactory impairment. It has been estimated that virtually everyone reaching their sixth or seventh decade has some smell impairment, and for many it is such that they feel they can smell and therefore "taste" nothing. As many as 50% of octogenarians are known to be anosmic.

Persons who have had a laryngectomy often have nasal congestion and a lack of nasal air flow and are effectively anosmic. Certain endocrine abnormalities, such as Addison's disease, Cushing's syndrome, hypothyroidism, diabetes mellitus, and numerous pituitary abnormalities, are associated with an impaired sense of smell. Although it is reported that certain nutritional deficiencies, such as of vitamins A, B_6, B_{12}, and trace-metal deficiencies, such as zinc and copper, impair the sense of smell, these are uncommon causes.

A field of increasing interest is the effect of drugs on olfaction. Several medications, such as corticosteroids, anticancer agents, antirheumatics, antithyroid hormones, hypolipidemic medications, psychopharmaceuticals, sympathomimetics, and others, can cause olfactory disturbances. These are diagnoses of exclusion. Drug-induced impairments typically occur with long-term exposure; hence, it is difficult to correlate the use of such medications with the impaired sense of smell. Several medical or surgical interventions have been associated with smell impairment. Any intranasal procedure can destroy the olfactory receptors. Radiation therapy, arteriography, influenza vaccination, and surgical therapy on the adrenocortical axis are all recognized causes.

Impaired olfaction is a common and increasing problem. To those who are impaired, it can be anything from a nuisance to a major disability. Physicians should be sensitive to the complaints of smell-impaired patients and, when appropriate, ensure proper referral and evaluation.

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Positron Emission Tomographic Imaging of the Head and Neck

ALTHOUGH POSITRON EMISSION TOMOGRAPHY (PET) has been used primarily as a research tool, advances in this technology have made it a powerful diagnostic tool as well. It complements the information obtained from computed tomography (CT) and magnetic resonance imaging (MRI) by demonstrating disorders of function in the absence of any anatomic abnormalities. Positron emission tomography produces images that reflect the distribution of decaying radioisotopes in vivo. Some radioactive isotopes decay by emitting a positron (positively charged electron) that collides with a local electron, resulting in annihilation. This reaction releases two photons traveling at 180 degrees of each other that are then detected by opposite radiation detectors arranged in a ring around the patient. These short-lived radioisotopes are incorporated into compounds such as water, carbon dioxide, glucose, and receptor-binding ligands. Fluorine 18-labeled 1-fluoro-2-deoxyglucose (fludeoxyglucose [^{18}FDG]), for example, is a glucose analogue that can be used to measure local glucose metabolism.

Positron emission tomography is being investigated for use in head and neck tumors. In both primary and metastatic tumors, aerobic glycolysis is often increased. Using the glucose analogue ^{18}FDG, PET can delineate these areas of hypermetabolism and identify primary tumors not detected by anatomic imaging. For example, PET can detect head and neck lymphoma and squamous cell carcinoma, which are seen as areas of increased ^{18}FDG accumulation. Because some submucosal or superficial head and neck tumors do not distort tissue planes or invade adjacent structures, MRI and CT may not detect them. Similarly, postirradiation or postsurgical anatomic changes may appear similar to recurrent tumor by conventional techniques. Furthermore, small tumor-infiltrated lymph nodes that are judged nonmetastatic by MRI or CT sometimes are visible on PET because of their increased metabolic activity. Although increased ^{18}FDG uptake in lymph nodes is not pathognomonic for metastasis, early experience suggests that in some cases it may be a sensitive indicator of nodal disease. Overall, there is potential for improving the evaluation of malignant lesions.

Positron emission tomography is also under study to determine the effectiveness of radiation therapy in head and neck cancers. Patients undergoing chemotherapy or radiation therapy may be better managed now that PET can provide information on tumor regression. Tumors responding to therapy show decreased ^{18}FDG uptake, whereas sites of recurrence can be detected by increased uptake. Also, studies have shown that substantial correlation exists between ^{18}FDG uptake and histologic grade; this deserves further investigation.

Although PET is expensive and requires a nearby cyclotron for the synthesis of short-lived radioisotopes, it has the potential to detect carcinomas not evident with other imaging techniques such as MRI or CT. Rather than replacing MRI or CT, PET may complement these techniques in the management of head and neck cancers.

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Preserving Hearing in Acoustic Neuroma Removal

RECENT ADVANCES IN MICROSURGERY for the excision of acoustic neuromas now allow the hearing to be preserved. These tumors arise from the vestibular nerve; the facial and cochlear nerves are intimately adherent and at risk for injury during tumor removal. A team approach with a skilled microneurosurgeon and a neuro-otologist experienced in temporal bone operations is essential. Technical advances during the past decade in neuroimaging, audiology, neurophysiology, neuroanesthesia, and operating rooms with microsurgical instruments and continuous intraoperative monitoring make these procedures possible.

Magnetic resonance imaging (MRI) using radioactive gadolinium provides excellent multiplanar views of acoustic neuromas with detailed relationship to critical neural structures. Computed tomography (CT) complements the anatomic detail of MRI by showing the bony labyrinthine structures and internal auditory canal in the temporal bone. Details of temporal bone structure are important to preserve the semicircular canals and labyrinth while the internal auditory canal is opened with a high-speed drill to view the tumor.

Preoperative neuroimaging, audiometric and electrophysiologic evaluation with pure-tone testing, speech reception threshold, speech discrimination scores, and brain-stem auditory evoked responses are key prognostic indicators for preserving the hearing. A speech reception threshold of less than 50 dB and speech discrimination scores of greater than 50% are considered minimal "serviceable" hearing indicators for surgically preserving the hearing; yet simply "hearing spoken words" is a good practical assessment of "useful" hearing. These preoperative evaluations give surgeons invaluable information for surgical planning and for counseling patients regarding hearing preservation.